

Report Date: 30 Jun 2014

**Summary Report for Individual Task
551-88L-2059
Maintain an Air Conditioning System
Status: Approved**

Distribution Restriction: Approved for public release; distribution is unlimited.

Destruction Notice: None

Foreign Disclosure: FD5 - This product/publication has been reviewed by the product developers in coordination with the [installation/activity name] foreign disclosure authority. This product is releasable to students from all requesting foreign countries without restrictions.

Condition: Given an operational air conditioning system aboard a vessel, at sea, at anchor or moored alongside a pier, day or night, under all sea and weather conditions, while wearing appropriate PPE, (i.e. hearing protection, Nitrile gloves, eye protection, etc.), with a lock out tag out kit and a marine rail tool box.

Standard: The Soldier correctly maintains an air conditioning system aboard an Army vessel, IAW the appropriate Technical Manual and local SOPs, without injury to self or others and without damage to equipment. The air conditioning system was fully mission capable at task completion.

Special Condition: None

Safety Risk: Medium

MOPP 4:

Task Statements

Cue: None

DANGER

None

WARNING

None

CAUTION

None

Remarks: None

Notes: None

Performance Steps

1. Conduct a visual check of common items in the environmental control subsystem.

a. There are some common items to check all over the environmental control subsystem. These include the following:

- (1) Bolts, clamps, nuts, and screws.
- (2) Welds.
- (3) Electrical wires, connectors, and harnesses.
- (4) Hoses and fluid lines.

b. Check these items for;

(1) Bolts, clamps, nuts, and screws:

- (a) Continuously check for looseness.
- (b) Look for chipped paint, bare metal, rust, or corrosion around bolt and screw heads and nuts.
- (c) Tighten them when you find them loose. If tools are not available, notify unit maintenance.

(2) Welds:

- (a) Many items on the environmental controls are welded.
- (b) To check these welds, look for chipped paint, rust, corrosion, or gaps.
- (c) When these conditions exist, notify unit maintenance on DA Form 2404.

(3) Electrical wires, connectors, and harnesses:

- (a) Tighten loose connectors.
- (b) Look for cracked or broken insulation, bare wires, and broken connectors.
- (c) If any are found, notify unit maintenance on DA Form 2404.

(4) Hoses and fluid lines:

- (a) Look for wear, damage, and leaks, and make sure clamps and fittings are tight.
- (b) Wet spots mean a leak.
- (c) A stain near a fitting or connector can also mean a leak.
- (d) When you find a leak, notify unit maintenance on DA Form 2404.

2. Conduct maintenance of the air conditioning and/or chill water plant, (refer to Figure 551-88L-2059_01 and 02).

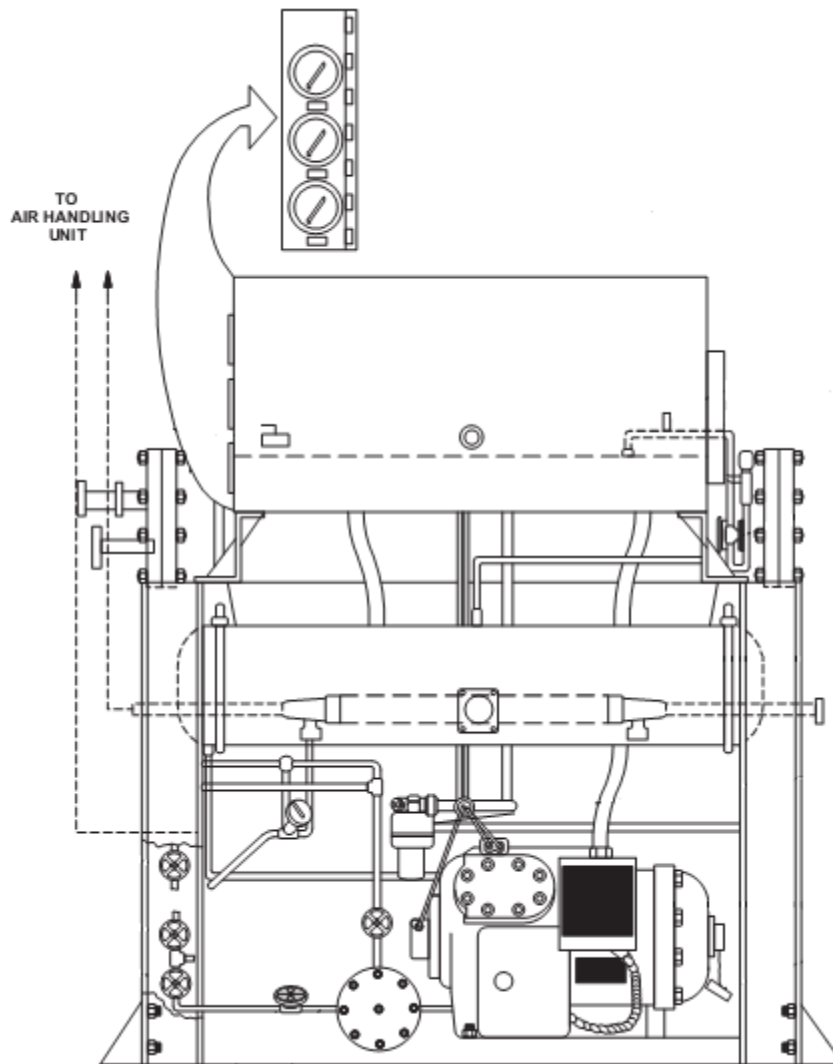


Figure 551-88L-2059_01
Air Conditioning Plant

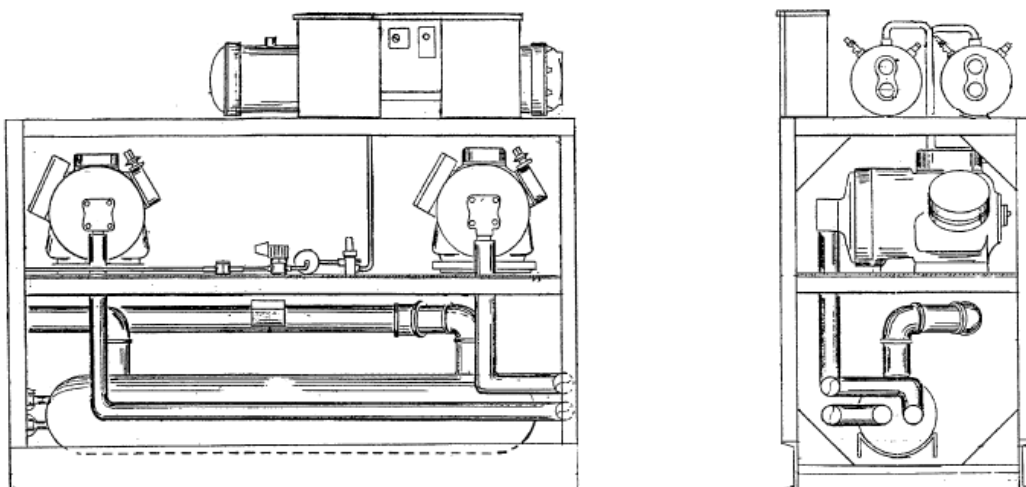


Figure 551-88L-2059_02
Chill Water Plant

a. Review operating log.

(1) Review operating log and note any significant changes in plant performance.

(2) Take corrective action.

b. Test for refrigerant leaks.

(1) Test all refrigerant piping joints, fittings, valves and compressor gasketed joints.

(2) Use an electronic halogen leak detector or halide gas leak detector.

(3) Testing with soap suds at joints will only detect the larger leaks and therefore is ineffective in determining the tightness of the system.

c. Test operation of solenoid valves, (refer to Figure 551-88L-2059_03).

(1) When a solenoid valve opens, a definite click is heard.

(2) When it shuts, a click of less intensity is heard.

(3) An open solenoid valve can be detected by a humming sound when the ear is held close to the valve casing.

(4) To test the operation of the valve, cycle the valve using the power disconnect.

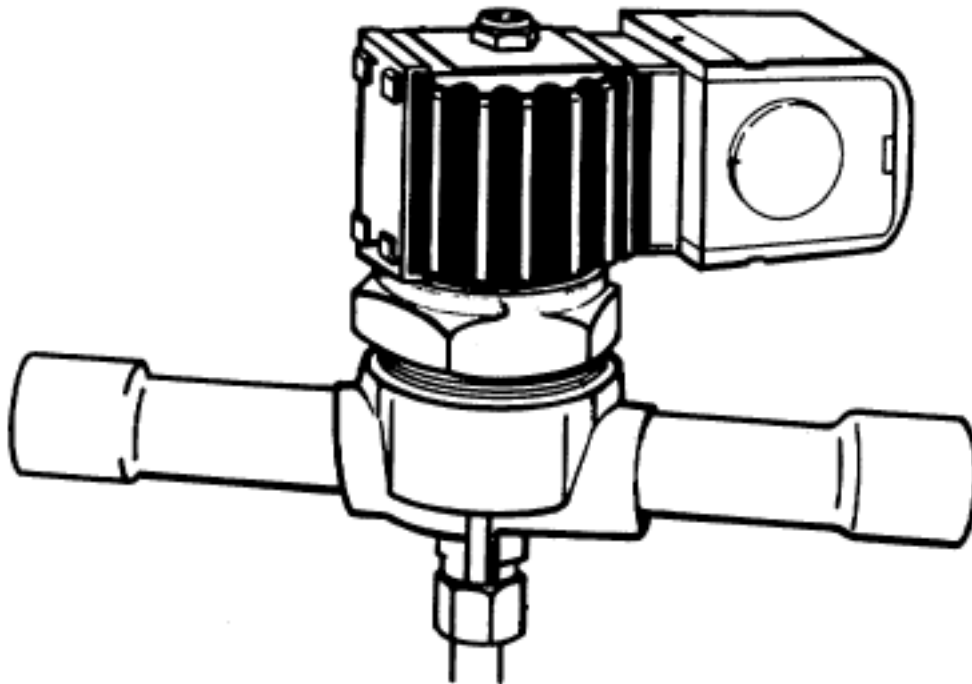


Figure 551-88L-2059_03
Solenoid Valve

d. Test for condenser leaks, (refer to Figure 551-88L-2059_04).

(1) To avoid serious loss of refrigerant or possible entrance of water into the refrigerant system, test condenser for leaks.

(2) If a refrigerant leak is suspected inside the condenser an electronic halogen leak detector or halide gas leak detector can be used at the water overboard discharge to check for refrigerant.

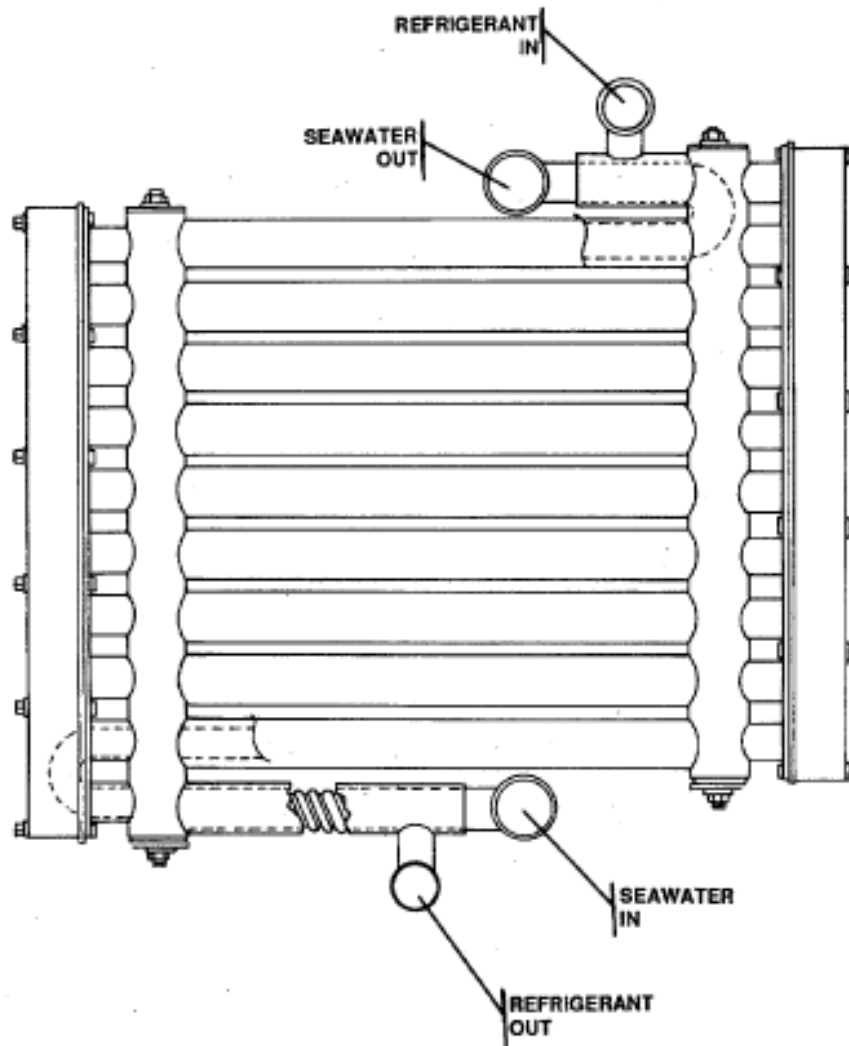
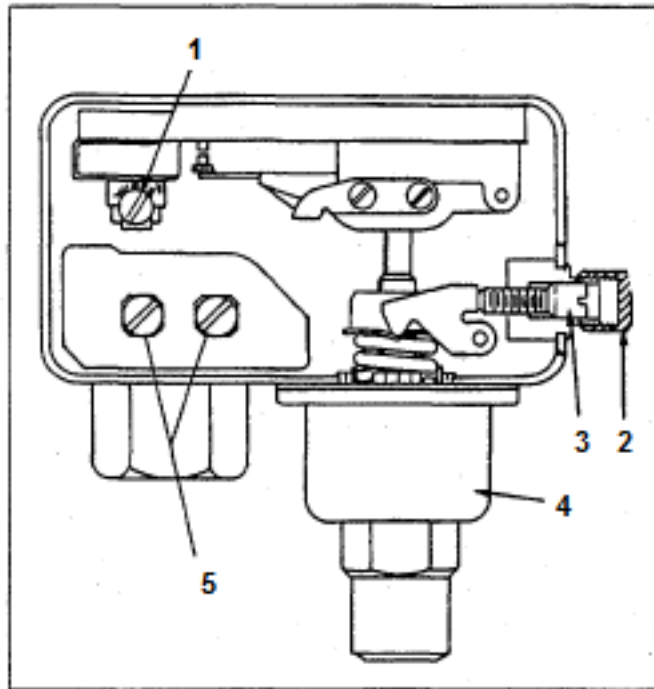


Figure 551-88L-2059_04
Water Cooled Condenser

e. Test switches and controls (refer to Figure 551-88L-2059_05).

(1) Check operation and settings of switches such as the discharge pressure switch, suction pressure switch, oil pressure switch, and thermostats.

(2) All switches should be tested in accordance with the systems technical manual.



- 1. Differential Adjustment Screw**
- 2. Cap (if supplied)**
- 3. Range Adjustment Screw**
- 4. Bellows Assembly**
- 5. Electrical Connections**

Figure 551-88L-2059_05
Pressure Switch

f. Check overall plant.

- (1) Check overall condition of refrigeration equipment.
- (2) Replace any missing covers or guards; check all clamps, hangers and mounting hardware.
- (3) Under highly corrosive conditions, clean and re-paint any rusted parts with rust preventive paint.

g. Check compressor oil level, (refer to Figure 551-88L-2059_06).

- (1) Visually check the oil level by viewing the sight glass in the compressor crankcase.
- (2) Shut down the compressor and allow oil to settle for 5 minutes before checking.
- (3) The oil level should be near the halfway point in the sight glass.
- (4) If oil level is incorrect, add or remove oil in accordance with the systems technical manual.

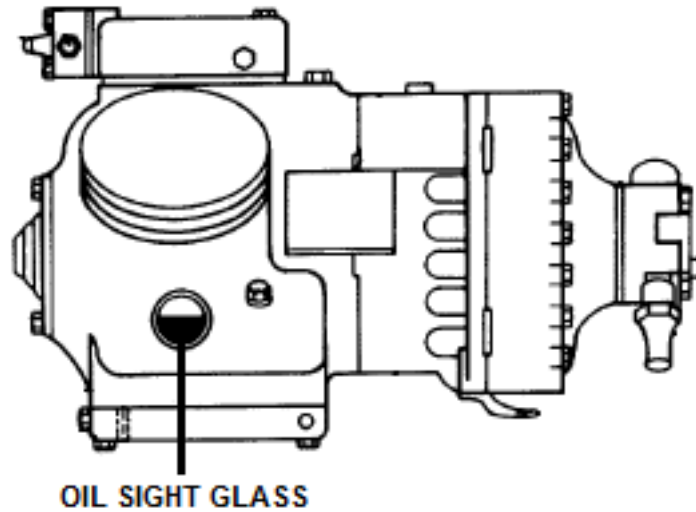


Figure 551-88L-2059_06
Compressor Oil Level

h. Check suction and discharge pressures, (refer to Figure 551-88L-2059_07).

(1) Suction (low) and discharge (high) pressures should always be checked while the compressor has been running for at least 30 minutes. This period of time is required for stable operation.

(2) During the check -all thermostats should be set as cold as possible and all mode selector switches should be in the 'COOL' position.

(3) A manifold gauge will be required to check pressures. A thorough understanding of this tool and the proper connection procedure is necessary for proper testing as well as the technician's safety.

(4) Operating pressures for the suction (low) and discharge (high) sides of the system should be within the normal operating range specified in the systems technical manual.

(5) The water regulating valve may be adjusted to maintain the correct system operating discharge pressure as per the systems technical manual.

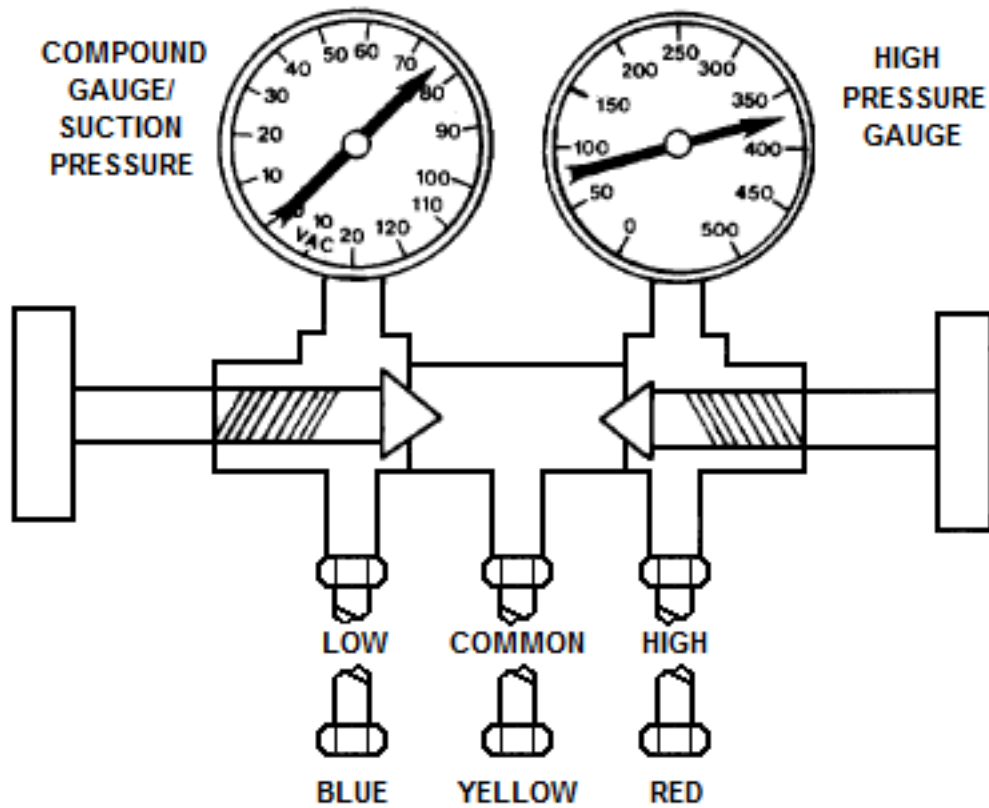


Figure 551-88L-2059_07
Gauge Manifold Set

i. Check the sight flow indicator, (refer to Figure 551-88L-2059_08).

- (1) The sight flow indicator should be completely clear whenever the compressor is running more than 15 minutes.
- (2) A foggy or bubbling liquid indicates a shortage of refrigerant.
- (3) Refrigerant should not be added to the system if the sight glass is clear.

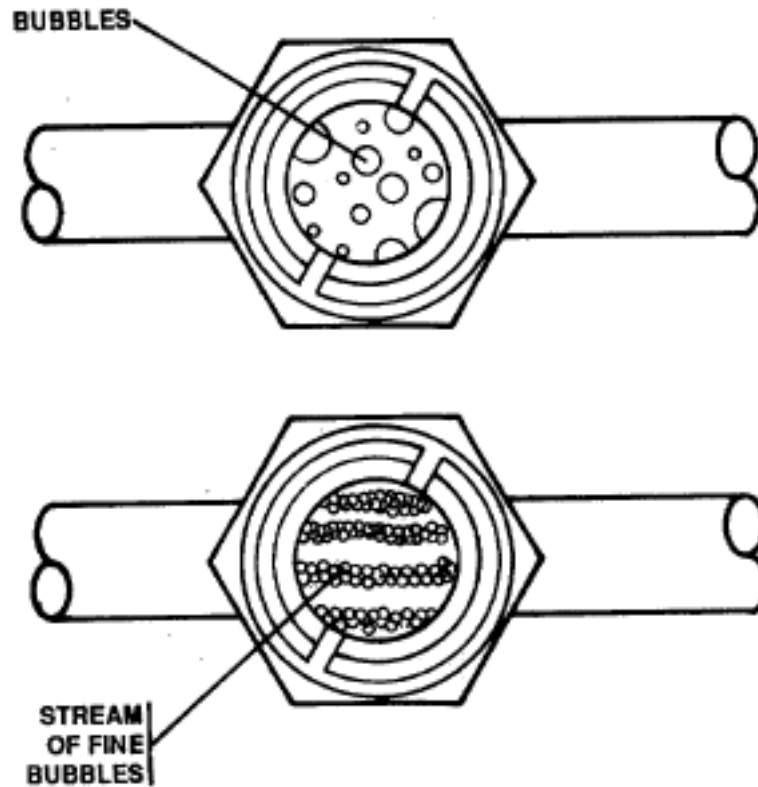


Figure 551-88L-2059_08
Sight Flow Indicator

j. Check condenser zinc anodes.

- (1) Shut off cooling water supply to condenser.
- (2) Open condenser vent valves and drain valves and drain condenser.
- (3) Remove the zinc anode holders and anodes.
 - (a) Clean the anode by hitting it against a hard surface or striking it with a hammer.
 - (b) If more than 60 % of the original material has been consumed, renew anodes.
- (4) Place condenser cooling water system back in operation in accordance with shipbuilder instructions.

k. Check all valves, (refer to Figure 51-88L-2059_09).

- (1) Check condition of all automatic and hand-operated valves.
- (2) Check operation of all automatic and hand-operated valves.

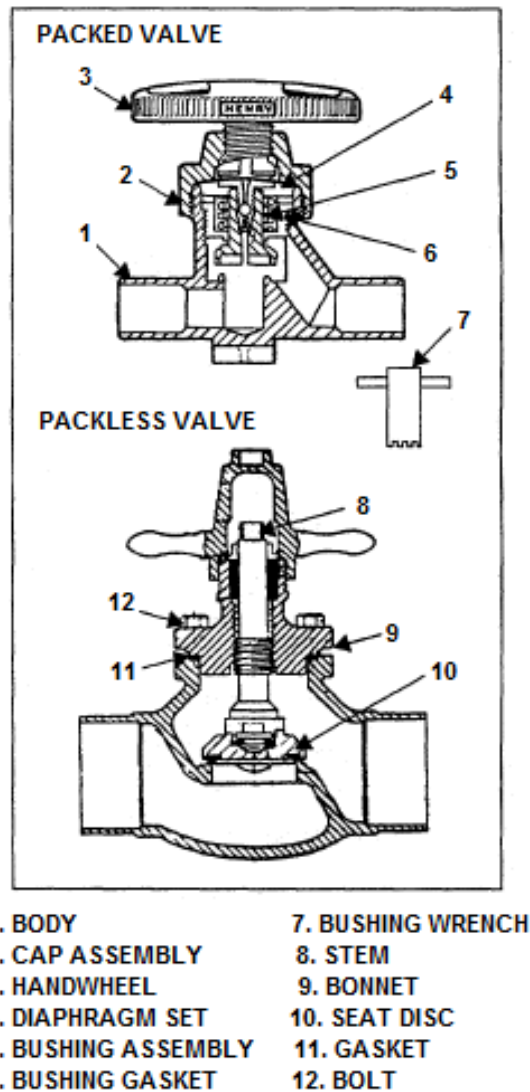


Figure 551-88L-2050_09
Hand Valves

I. Clean condenser.

(1) Clean shell and coil condensers chemically using inhibited hydrochloric acid solution (OAKITE 32). Handle acid with care.

(2) Shut off water supply.

(3) Disconnect inlet and outlet piping.

(4) Clean condenser with acid solution by gravity or forced circulation.

(a) For average scale deposits, allow acid solution to remain in condenser overnight.

(b) For heavy scale deposits, allow acid solution to remain in condenser for 24 hours.

(5) Drain condenser and flush with clean water.

(6) Reconnect inlet and outlet piping.

(7) Restore water supply.

3. Conduct maintenance of air conditioning units, (refer to Figure 551-88L-2059_10).

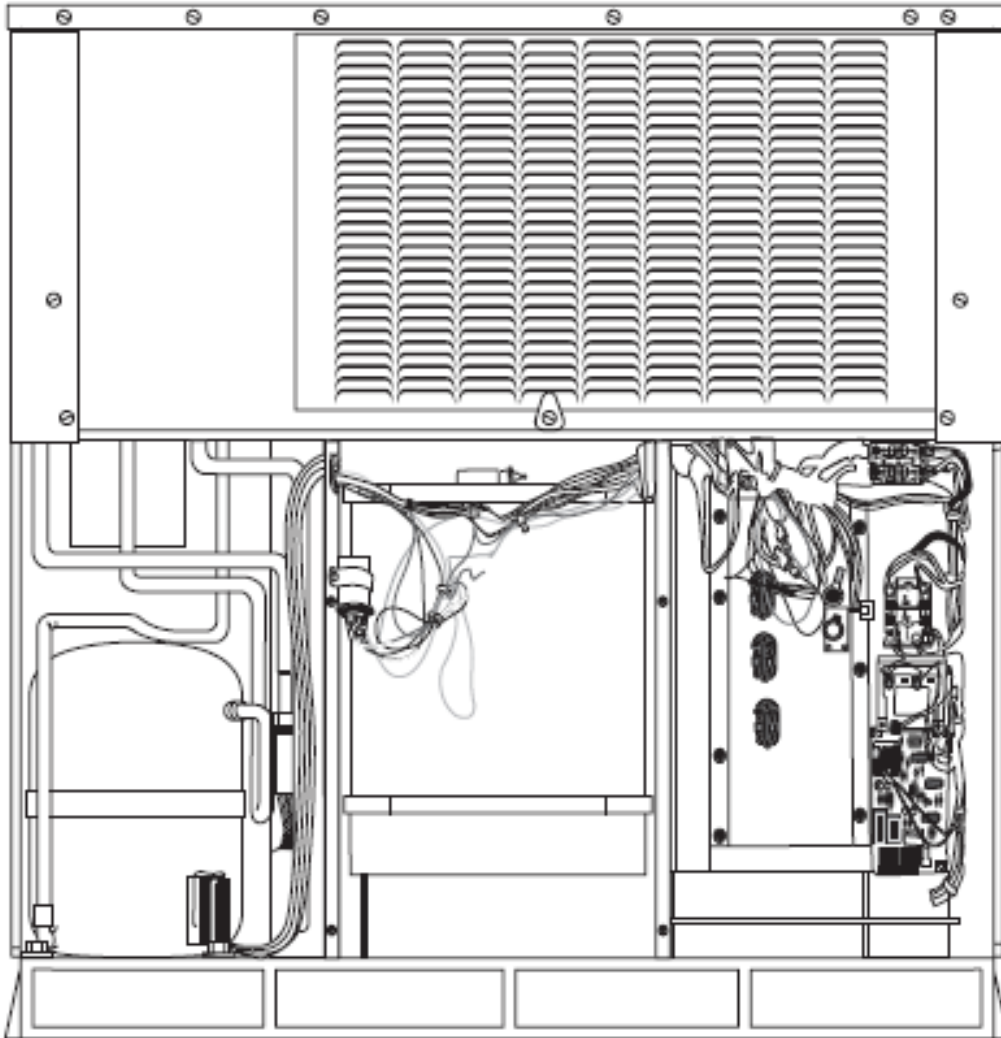


Figure 551-88L-2059_10
Air Conditioning Unit

a. Air conditioning units.

(1) Check for buildup of dirt and debris on compressor, condenser, and other external cabinet components.

(2) Clean with rags, soft brush, or vacuum cleaner with non-metallic nozzle.

b. Cooling coils/evaporators.

(1) Clean buildup of dust and debris from the surface of the coil with a soft bristle brush.

(2) Compressed air of less than 30 psi may be used to further remove dust and debris from the air passages through the coil.

(3) If extremely dirty clean coils with manufacturer recommended non-acid cleaning solution.

c. Check suction and discharge pressures.

(1) Suction (low) and discharge (high) pressures should always be checked while the compressor has been running for at least 30 minutes. This period of time is required for stable operation.

(2) During the check -all thermostats should be set as cold as possible and all mode selector switches should be in the 'COOL' position.

(3) A manifold gauge will be required to check pressures. A thorough understanding of this tool and the proper connection procedure is necessary for proper testing as well as the technician's safety.

(4) Operating pressures for the suction (low) and discharge (high) sides of the system should be within the normal operating range specified in the systems technical manual.

4. Conduct maintenance of the air handlers.

a. Check air filters in accordance with TASK 551-88L-2064, Step 2.

b. Check ventilation fans in accordance with TASK 551-88L-2064, Step 3.

c. Check ventilation fan motors for cleanliness in accordance with TASK 551-88L-2056, Step 1.d.(1).

d. Lubricate fan motor in accordance with TASK 551-88L-2056, Step 2.

e. Clean the coils.

(1) Vacuum the coils with a wet/dry vacuum.

(2) And/or wash down with fresh water.

(3) If extremely dirty clean coils with manufacturer recommended cleaning solution.

(4) Bent coil fins may be straightened with a fin comb.

f. Check drain pan drains.

(1) Check drain pan, drain pan line and traps for;

(a) Scale.

(b) Cleanliness.

(c) Debris.

(2) If required clean drain pan, drain line and traps.

(a) Vacuum with a wet/dry vacuum.

(b) Wash down with fresh water.

(c) Traps may be cleaned of clogs with a snake.

g. Check chilled water circulating fan coils.

(1) With the chilled water pump running, check all fan coils for proper water circulation. Poor circulation is a result of air trapped in the system or a shortage of water.

(a) Each fan coil and convactor is equipped with bleed valves for air release.

(b) Open air bleed valves and allow all air to escape.

1 Pilot house fan coils are at the highest point and should be bled first.

2 Every coil may have to be checked several times.

(2) Check system fill tank located on top of the pilot house.

(a) Be sure the tank is clean and full-of water above the top sight gauge.

(b) Check the mixture monthly for ethylene glycol strength.

h. Check refrigerant circulating fan coils.

(1) With the system running check the coils for icing.

(a) If the evaporator coil ices over, the refrigerant cannot flash off completely causing liquid flood back and icing of the suction line all the way back to the compressor.

(b) Coil icing may be caused by;

1 Insufficient air flow caused by;

a Dirty air filters.

b Obstructed air intake.

c Dirty coil.

2 Low refrigerant.

3 Malfunction of the thermal expansion valve.

(2) If coil is iced over;

(a) Shut the system down.

(b) Switch the fan from 'AUTO' to 'ON'.

(c) Allow coil to deice with natural air flow or use a heat gun.

(d) Do not chip away ice as this may cause damage to the coil.

(3) Once the coil is deiced;

(a) Clean the coil with an approved coil cleaner.

(b) Place the system back in normal operation.

(c) Check suction and discharge pressures.

1 Suction (low) and discharge (high) pressures should always be checked while the compressor has been running for at least 30 minutes. This period of time is required for stable operation.

2 During the check -all thermostats should be set as cold as possible and all mode selector switches should be in the 'COOL' position.

3 A manifold gauge will be required to check pressures. A thorough understanding of this tool and the proper connection procedure is necessary for proper testing as well as the technician's safety.

4 Operating pressures for the suction (low) and discharge (high) sides of the system should be within the normal operating range specified in the systems technical manual.

(d) Check the super heat of the evaporator coil for proper thermal expansion valve operation.

1 Firmly attach and insulate a thermometer on the inlet side of the TXV.

2 Firmly attach and insulate a thermometer to the outlet side of the evaporator.

3 Note the temperature difference between the inlet of the TXV and the outlet of the evaporator.

a Superheat should be within the manufacturers recommended setting.

b Superheat is normally between 10 and 20 degrees.

4 If unable to get to the TXV and evaporator, attach the thermostats as close as possible to the evaporator on the inlet and outlet piping.

5 If superheat is incorrect refer to troubleshooting TASK 551-88L-3066.

(Asterisks indicates a leader performance step.)

Evaluation Guidance: None

Evaluation Preparation: None

PERFORMANCE MEASURES	GO	NO-GO	N/A
1. Conducted a visual check of common items in the environmental control subsystem.			
a. Bolts, clamps, nuts, and screws.			
b. Welds.			
c. Electrical wires, connectors, and harnesses.			
d. Hoses and fluid lines.			
2. Conducted maintenance of the air conditioning and/or chill water plant.			
a. Reviewed operating log.			
b. Tested for refrigerant leaks.			
c. Tested operation of solenoid valves.			
d. Tested for condenser leaks.			
e. Tested switches and controls.			
f. Checked overall plant.			
g. Checked compressor oil level.			
h. Checked suction and discharge pressures.			
i. Checked the sight flow indicator.			
j. Checked condenser zinc anodes.			
k. Checked all valves.			
l. Cleaned condenser.			
3. Conducted maintenance of air conditioning units.			
a. Air conditioning units.			
b. Cooling coils/evaporators.			
c. Checked suction and discharge pressures.			
4. Conducted maintenance of the air handlers.			
a. Checked air filters in accordance with TASK 551-88L-2064.			
b. Checked ventilation fans in accordance with TASK 551-88L-2064.			
c. Checked ventilation fan motors for cleanliness in accordance with TASK 551-88L-2056.			
d. Lubricated fan motor in accordance with TASK 551-88L-2056.			
e. Cleaned the coils.			
f. Checked drain pan drains.			
g. Checked chilled water circulating fan coils.			
h. Checked refrigerant circulating fan coils.			

Supporting Reference(s):

Step Number	Reference ID	Reference Name	Required	Primary
	TM 55-1905-223-24-17	UNIT, INTERMEDIATE DIRECT SUPPORT AND INTERMEDIATE GENERAL SUPPORT MAINTENANCE INSTRUCTIONS FOR ENVIRONMENTAL CONTROL SUBSYSTEM FOR LANDING CRAFT UTILITY (LCU) (NSN 1905-01-154-1191) (REPRINTED W/BASIC IN	No	No
	TM 55-1915-208-24&P	UNIT INTERMEDIATE DIRECT SUPPORT AND INTERMEDIATE GENERAL SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST) FOR ENVIRONMENTAL CONTROL SYSTEM P/N LM2-WC30-65, 39BA-050, 42CG, 42VF,	No	No
	TM 55-1915-254-10-1	OPERATOR'S MANUAL FOR LOGISTICS SUPPORT VESSEL (LSV-7 & -8)	No	No
	TM 55-1915-254-10-2	OPERATOR'S MANUAL FOR LOGISTICS SUPPORT VESSEL (LSV-7 & -8)	No	No
	TM 55-1925-224-24&P	UNIT, INTERMEDIATE DIRECT SUPPORT AND INTERMEDIATE GENERAL SUPPORT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST) FOR ENVIRONMENTAL CONTROL SUBSYSTEM FOR LARGE TUG (LT) (NSN 1925-01-24	No	No

Environment: Environmental protection is not just the law but the right thing to do. It is a continual process and starts with deliberate planning. Always be alert to ways to protect our environment during training and missions. In doing so, you will contribute to the sustainment of our training resources while protecting people and the environment from harmful effects. Refer to FM 3-34.5 Environmental Considerations and GTA 05-08-002 ENVIRONMENTAL-RELATED RISK ASSESSMENT.

Safety: In a training environment, leaders must perform a risk assessment in accordance with ATP 5-19, Risk Management. Leaders will complete the current Deliberate Risk Assessment Worksheet in accordance with the TRADOC Safety Officer during the planning and completion of each task and sub-task by assessing mission, enemy, terrain and weather, troops and support available-time available and civil considerations, (METT-TC). Note: During MOPP training, leaders must ensure personnel are monitored for potential heat injury. Local policies and procedures must be followed during times of increased heat category in order to avoid heat related injury. Consider the MOPP work/rest cycles and water replacement guidelines IAW FM 3-11.4, Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical (NBC) Protection, FM 3-11.5, Multiservice Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Decontamination.

Prerequisite Individual Tasks : None

Supporting Individual Tasks :

Task Number	Title	Proponent	Status
551-88L-2064	Maintain a Ventilation System	551 - Transportation (Individual)	Approved
551-88L-1043	Identify Basic Components of a Heating Ventilation and Air Conditioning (HVAC) System	551 - Transportation (Individual)	Analysis
551-88L-3070	Troubleshoot a Ventilation System	551 - Transportation (Individual)	Approved
551-88L-2060	Maintain a Heating System	551 - Transportation (Individual)	Approved
551-88L-3066	Troubleshoot an Air Conditioning System	551 - Transportation (Individual)	Approved
551-88L-3067	Troubleshoot a Heating System	551 - Transportation (Individual)	Approved
551-88L-2056	Maintain an Electric Motor	551 - Transportation (Individual)	Approved

Supported Individual Tasks :

Task Number	Title	Proponent	Status
551-88L-3066	Troubleshoot an Air Conditioning System	551 - Transportation (Individual)	Approved
551-88L-2039	Conduct The Engine Room Watch	551 - Transportation (Individual)	Approved
551-881-9049	Direct the Maintenance of an Air Conditioning System	551 - Transportation (Individual)	Approved
551-88L-1043	Identify Basic Components of a Heating Ventilation and Air Conditioning (HVAC) System	551 - Transportation (Individual)	Proposed
551-88L-1043	Identify Basic Components of a HVAC System	551 - Transportation (Individual)	Approved
551-88L-1043	Identify Basic Components of a Heating Ventilation and Air Conditioning (HVAC) System	551 - Transportation (Individual)	Analysis
551-88L-4033	Review HVAC Theory	551 - Transportation (Individual)	Approved
551-88L-3070	Troubleshoot a Ventilation System	551 - Transportation (Individual)	Approved
551-88L-2060	Maintain a Heating System	551 - Transportation (Individual)	Approved
551-88L-2056	Maintain an Electric Motor	551 - Transportation (Individual)	Approved
551-88L-2064	Maintain a Ventilation System	551 - Transportation (Individual)	Approved
551-88L-3067	Troubleshoot a Heating System	551 - Transportation (Individual)	Approved
551-881-8082	Conduct Field Maintenance on an Air Conditioning System	551 - Transportation (Individual)	Approved

Supported Collective Tasks : None**ICTL Data :**

ICTL Title	Personnel Type	MOS Data
88L30 Watercraft Engineer	Enlisted	MOS: 88L, Skill Level: SL3, Duty Pos: TFR, LIC: EN
88L40 Watercraft Engineer	Enlisted	MOS: 88L, Skill Level: SL4, Duty Pos: TGB, LIC: EN, SQL: O
88L20 Watercraft Engineer	Enlisted	MOS: 88L, Skill Level: SL2, Duty Pos: TFS, LIC: EN